In an open country, which is characteristic of most o Kansas, a tornado cloud can be seen for miles and there is generally opportunity to take refuge when it occurs in the daytime. The most common and effective shelter is the far-famed "cyclone cellar," which is a cave near a residence, partially underground, with its top covered with soil and commonly used for dairy products and storing fruits and vegetables. Next in frequency of use for refuge is the southwest corner of the cellar or basement of a frame house. There are elements of danger in this, however, as, should the house be blown away, the cellar is likely to be partially filled with débris blown in with great violence. Instances have been reported where persons have survived by lying down in a ditch or shallow excavation, or simply on the lee side of a tree and locking the arms about it. In all these cases there is danger from flying pieces of timber or other objects with which the air is generally filled during such a storm; also a tree is likely to be uprooted if it is near the center of a storm path.

The freakish occurrences that result from these storms will tax the credulity of a person who has never seen them. Undoubtedly there is the usual tendency to exaggerate them, but after examining the wreckage a person is inclined to believe almost any story that is told. The often-recited instances of straws being blown with such violence they are left sticking in the bark and even in the wood of a tree or fence post have to be seen in order to be appreciated. Chickens are sometimes stripped of their feathers and left alive, though more often they are killed, if near enough the vortex of the cloud for that to happen. An instance has been related on creditable authority of a dresser being smashed to kindling and its mirror carried some distance and set down against a fence without being cracked; also of a window sash being blown from a railway depot, which was demolished, and laid down on an adjoining lawn with a heavy iron scale weight on it without the glass being broken. A glass jar of fruit from a shelf in this same depot was blown a considerable distance and picked up later in perfect condition. The writer has known of an instance where a well-built schoolhouse was torn into small pieces and large elm trees about it uprooted, yet a small coal shed among the trees and a short distance from the schoolhouse escaped with only one board missing. It is interesting to note that several people who had vainly tried to get into the schoolhouse for shelter from the storm had taken refuge in this coal shed and escaped uninjured. One of the remarkable features noted in reading over the accounts of these storms is the number of almost miraculous escapes. Unexplainable and almost unbelievable occurrences similar to the above that have come to the attention of the writer might be repeated at great length.

Tornado paths seem to be almost entirely independent of the topography of a country, popular opinion to the contrary notwithstanding. It is often said of a town which has never been visited by one that it owes its immunity to being in a valley, but the tornado of June 5, 1917,[1] crossed the Kansas River Valley a few miles above Topeka, mowing down trees on the steep slope of the high bluff as it descended into the south side of the valley and demolishing the little town of Elmont, which is on the lee side of a high bluff in the valley of Halfcreek.

Lightning is sometimes erroneously said never to strike twice in the same place, but this is certainly not true of a tornado. The little town of Codell, in Rooks County, Kans., in the western part of the State, was struck by a tornado on May 25 for three years in succession, each storm coming at approximately the same hour of the day.[1]

It is not at all unusual to find persons in Kansas who have been eyewitnesses of tornadoes, but photographs of the cloud are exceedingly rare. Usually one is so absorbed in watching the unusual sight or in getting to a place of safety that a camera is not thought of until it is too late. The views accompanying this article were collected by the writer in connection with an investigation of these storms in Kansas that has extended over a period of 12 years and the sources from which they have been received leave no doubt as to their authenticity.

[1] Climatological Data, Kansas section, July, 1917.

NOTE ON TORNADOES.*

In a "Note on Tornadoes," Lieut. J. Logie, aimed at showing that no convection currents are capable of producing tornadoes of the intensity claimed for some of these storms. The author computed the difference of temperature between the air in the center of the tornado and that outside. For a tornado having a pressure reduction of 50 millibars at the surface the mean temperature difference was found to be 23° A if the tornado extended to 5 km. (16,000 feet), 10° A if it extended to 10 km., and 5° A if it extended to 15 km. From the known values of the lapse rate of saturated air, it follows that under conditions of maximum instability a saturated ascending current not less than 8 km. high might produce a tornado of this intensity. Since such instability rarely occurs, and in addition ascending currents of saturated air are usually everywhere penetrated by descending masses of cooler air, even a tornado of this intensity is unlikely to be so produced in natural conditions.—*Symons's Metl. Mag., July, 1919, p. 67.*

A LOCAL STORM AT ABERDEEN PROVING GROUND, MD., JULY 6, 1919.

By OTTO NEUMER.

The hot spell of early July came to a close at Aberdeen, Md., with a thunderstorm marked by heavy rainfall, and high winds which wrecked a Handley-Page aeroplane standing on the aviation field. The maximum temperature for the 3d was 93°F.; the 4th, 94°F.; and the 5th, 94°F. The minima were successively 59°F, 66°F, 69°F., and 72°F., the last being in the night of the 5th and 6th. During the 5th and 6th of July, the surface winds were southeast, very warm and moist. At 2:15 p. m. (75th meridian time) of the 5th there was a west wind at an altitude of 3,000 meters. On Sunday morning, the 6th, the surface wind was southeast, but veered rapidly with altitude until at 1,700 meters it was coming from the west. These west winds aloft were probably potentially colder than those at the surface, and in passing over the warm southerly winds formed a decided temperature gradient.

Cumulus clouds developed on the morning of the 6th, and early in the afternoon covered about half the sky. The sun became obscured at 2:25. At 3:30 p. m. the wind suddenly veered from south to west, backing to southwest at 4:40 p. m. and rising from 8.5 to 30 miles per hour. At the same time the sky became overcast with heavy stratus clouds. Rain began falling at 4:43, the temperature suddenly dropped from 82°F. to 65°F., and

[1] Climatological Data, Kansas section, July, 1919.
* Roy. Meterological Soc., June 18, 1919.

the relative humidity rose rapidly from 63 to 98. The barograph recorded an abrupt rise in pressure from 29.55 inches to 29.63 inches, and continued to rise uniformly thereafter, attaining a pressure of 29.80 inches at 8:00 a. m., July 7. In the midst of the heaviest rainfall the wind attained a maximum velocity of 40 miles per hour at 4:50 p. m., at which time the wind backed from southwest to southeast, indicating that the center of the storm had passed probably on the south, since the squall wind usually blows out from the region of heaviest rainfall. Three minutes later, the wind veered to northwest from which direction it continued to blow for several hours after normal conditions were again restored. The rainfall during the first 17 minutes was 1.03 inches, of which 0.77 inch fell between 4:45 and 4:55 p. m. The rain continued till 5:30, giving a total of 1.24 inches for the storm. Other thunderstorms occurred in eastern Pennsylvania, New Jersey, and New York, but no rain fell at Baltimore or Washington.

The surface wind July 7 at 7:00 a. m. was north and at 1,100 meters northeast; conditions associated with an extensive HIGH over the Great Lakes.

PRELIMINARY MEETING OF OFFICIAL WEATHER BUREAU DIRECTORS AT LONDON, JULY 3-9, 1919.

By Dr. L. A. BAUER.

Department of Terrestrial Magnatism, Carnegie Institution of Washington.

[Dated Sept. 1, 1919.]

At the call of Sir Napier Shaw, the president of the prewar International Meteorological Committee, there was recently held in the Meteorological Office, London, from July 3–9, a preliminary meeting of such of the official weather bureau directors who could attend at short notice and who represented the allied and neutral countries. The prime purpose of the meeting was to reach some preliminary agreements, in advance of the proposed Paris Meteorological Conference meeting at the end of September, regarding official meteorological matters and interchange of data.

There were present Sir Napier Shaw, chairman, A. Angot (France), Lieut. Col. E. Gold, of the Meteorological Office, who served as secretary, E. Van Everdingen (Holland), Lieut. H. D. Grant (British Admiralty Meteorological Office), Th. Hesselberg (Norway), L. Palazzo (Italy), Capt. C. Ryder (Denmark), G. T. Walker (India), A. Wallén (Sweden), and L. A. Bauer, representing C. F. Marvin (United States).

The signal success of the meeting was due chiefly to Sir Napier, under whose tactful and skillful management decisions on many matters were put in form for submission to the coming Meteorological Conference at Paris. Entire harmony prevailed throughout the deliberations, the representatives of the various countries having free and cordial intercourse with one another.

Among the pleasant social events may be mentioned the visit to the Kew Observatory on the afternoon of July 3, and reception in the evening at the Meteorological Office; dinner tendered by the Meteorological Office at Bailey's Hotel, July 7; visit to W. H. Dines' observatory at Benson, July 8.

MEETING OF INTERNATIONAL UNION OF GEODESY AND GEOPHYSICS AT BRUSSELS, JULY 18-28, 1919.*

By Dr. L. A. BAUER.

Director, Department of Terrestrial Magnetism, Carnegie Institution of Washington.

[Dated Washington, Sept. 1, 1919.]

Under the auspices of the International Research Council there was established at Brussels, during the meeting of the Council in the Palais des Academies, July 18–28, 1919, various unions on Astronomy, Mathematics, Physics, Chemistry, Geodesy and Geophysics, and Scientific Radiotelegraphy.

The various countries, formerly at war with the Central Powers, were, in general, fully represented by officially appointed delegates. At the last session of the Council a resolution was passed respecting the entrance of other countries and the invitations to be extended to them.

The International Union of Geodesy and Geophysics, as finally established for a period of 12 years beginning on January 1, 1920, consists of the following sections:

(*a*) *Geodesy:* William Bowie (United States), president; Vicenzo Reina (Italy), vice president; Lieut. Col. Perrier (France), secretary and director of Central Bureau.

(*b*) *Seismology:* Owing to continuation of present agreement among countries with regard to the International Seismological Association, which is to continue for some time longer, it was not possible to organize this section definitely.

(*c*) *Meteorology:* Sir Napier Shaw, president; A. Angot, vice president; C. F. Marvin, secretary and director of Central Bureau.

(*d*) *Terrestrial Magnetism and Electricity:* A. Tanakadate (Japan), president; C. Chree (England), vice president; L. A. Bauer (United States), secretary and director of Central Bureau.

(*e*) *Physical Geography:* Naming of president deferred until entrance of neutral countries; H. Lamb (England), vice president; G. P. Magrini (Italy), secretary and director of Central Bureau; Sir Charles Close (England), and Mr. G. W. Littlehales (United States) were made members of the executive committee, in addition to president, vice president, and secretary.

(*f*) *Volcanology:* Prof. A. Riccò (Italy), president; H. S. Washington (United States), vice president; Dr. A. Malladra (Italy), secretary and director of Central Bureau.

The following officers of the Union were chosen: Charles Lallemand (France), president; Col. H. G. Lyons (England), general secretary; the presidents of the various sections are the vice presidents of the Union.

The opinion was expressed generally that in the *organization of work* for the various sections the endeavor should be to distribute the work among various committees rather than centralize the investigational work at the Central Bureaus.

At a preliminary meeting of the section on Meteorology, under the chairmanship of Col. Lyons, in the absence of Sir Napier Shaw, a brief discussion was held with regard to the work of the section. The general opinion was that

* A more detailed account is published in *Nature* (London), Aug. 14, 1919, pp. 464-466 (summarized in *Science*, Sept. 5, 1919, p. 226). A full account of the organization of the American section of this International Union of Geodesy and Geophysics is given in *Science*, Sept. 5, and 12, 1919, pp. 233-238, 255-259.